1998 Washington State Water Quality Assessment
Section 305(b) Report

(revised September 1997)

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Acronyms Used:

APM	Ecology's Ambient Monitoring Program
CFR	Code of Federal Regulations
EPA	The U.S. Environmental Protection Agency
GIS	Geographic Information System
REMAP	Regional Environmental Assessment and Monitoring Program
TMDL	Total Maximum Daily Load
USGS	The U.S. Geological Survey
WARIS	Washington Rivers Information System

Electronic Data Files Available:

The following computer files provide more detail on the results presented in this report.

exceed.prg	DBASE program used for assessing use support
fw-stat.xls	Freshwater stations assessed from Ecology's Ambient Monitoring Program
mw-stat.xls	Marine water stations assessed from Ecology's Ambient Monitoring Program
lakeass.dbf	DBASE file of location description of most lakes assessed
lakeass.dbt	DBASE memo field file of location description of most lakes assessed
usestat.xls	Use support assessment for individual stations for streams and estuaries
lakeuses.xls	Use support assessment for individual lakes
uses1.xls	Use support extrapolation statewide for streams and estuaries
uses2.xls	Use support extrapolation statewide for lakes
causstat.xls	Causes of use impairment for individual stations for streams and estuaries
lakecaus.xls	Causes of use impairment for individual lakes
causes.xls	Causes extrapolated statewide for streams and estuaries
sourstat.xls	Sources of use impairment for individual stations for streams and estuaries
lakesour.xls	Sources of use impairment for individual lakes
Sources.xls	Sources extrapolated statewide for lakes, streams, and estuaries

These files are available upon request at the contact listed below. Please specify which files you would like in your request.

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Introduction:

The federal Clean Water Act requires that seach state prepare an water quality assessment report every two year under Section 305(b). The U.S Environmental Protection Agency (EPA) compiles the information in the State reports, summarizes them, and transmts the summaries to Congress along with and analysis of the status of water quality nationwide.

The new guidance to the state's from EPA on developing the Section 305(b) assessment reports changes the type and frequncy of reporting. EPA is now implementing a 5-year reporting cycle. States must now prepare a written report every 5 years, instead of every 2 years, with the next full State report due in April 2001. In order to meet the mandate of a biennial report to Congress, EPA is asking states to submit certain assessment data annually which will be compiled for the national report.

This report serves to submit the data to EPA for the annual updates and document the methods used. Subsequent annual submittals will like be in electronic form as described in the guidance, with a reference to this document for assessment methods used.

Background:

The purpose of the Section 305(b) Report is to present to Congress (and the public) the current conditions of the state's surface waters. EPA has interpreted this to mean reporting on the status of the state's beneficial waters uses. A statewide estimate of the support of these uses is compiled with other states' estimates by EPA for a nationwide report.

Concerns have been raised in the past about the accuracy of the data reported in the state's biennial Section 305(b) Reports. Due to the inherent bias introduced by the methods used, the reports have presented to the public a worst-case perspective on water quality. The two main causes of this problem are the terminology used by EPA and the use of data from monitoring programs that are not designed for Section 305(b) objectives. Since EPA must combine all states data into a common framework, there is little that can realistically be done about their terminology. However, by addressing the monitoring design and assessment methods, a much more accurate and less-biased estimate of statewide conditions is possible.

For past reports all available data were used to prepare the assessments of use support. One type of bias that results in this approach is inclusion of data specifically sampled to characterize and identify known problems. For example, data submitted as part of the Section 303(d) listing process only includes those with violations of standards. Data that may have been sampled with the same survey that show no violations are not submitted. Using data from this list will result in reporting only on impaired waters and not on sampled waters that were fully supporting uses.

Most monitoring designs select sampling stations based on the presumption that there is a measurable problem at that location. Very rarely will agencies expend resources to monitor

waters which are considered pristine or not impacted by pollution. The bias introduced by the non-random process of station selection can have a great effect on the statewide estimates of use impairments for the Section 305(b) report.

Another type of bias is introduced by the different sampling season and frequency of numerous monitoring designs. The assessment of use support would be completely different depending on which monitoring design is used. Some monitoring is designed to characterize critical seasons, such as for dry-season TMDL studies. Other monitoring is designed to evaluate seasonal difference or long-term trends, such as at core ambient monitoring stations.

EPA guidance for the Section 305(b) report defines impairment according to the percentage of data exceeding the criterion. EPA defines uses as "partially supporting" if between 11-25% of the data exceeds the criterion and "not supporting" if there is an exceedance rate of 25% or greater. Due to problems of applying these frequency guidelines to different monitoring designs, Ecology used a different definition of the terms for the 1994 report -- a single exceedance was reported as "partially supporting" and 2 or more exceedances were reported as "not supporting".

Comparing data collected from different studies can show the effect of monitoring design on the assessment of use support. For example, a TMDL study might collect 6 samples in September with 4 exceeding the criterion. This 67% exceedance frequency would be assessed as not supporting uses. If an ambient monitoring station sampled monthly was placed at the same location, possibly only the September sample from the whole year might exceed the criterion. This 8% exceedance frequency would be assessed as fully supporting the uses. The big difference in assessments are frequently due to differences in monitoring design, not environmental conditions.

The new goal of EPA for the Section 305(b) report is for the states to assess all surface waters every 5 years. Monitoring all waters is not likely due to the lack of monetary resources. The traditional “census” approach to assessments will likely never result in a complete statewide picture.

One way EPA recommends conducting these statewide assessments is to use the “Sample Survey” approach to enable inferences about all waters from a subset of waterbodies. By estimating the statewide water quality conditions with this approach, one can more honestly answer the question that the Section 305(b) report is supposed to answer, namely "What is the overall quality of the waters in the state?"

Alternative Assessment Approach:

To reduce the bias introduced into the Section 305(b) assessments another approach is needed. The past practice of using data collected from numerous different sampling designs simply does not give an accurate estimate of statewide water quality. The data from these different sampling programs are combined to assess only a small portion of the state. These assessments are often

wrongly assummed by the public to represent the statewide conditions, instead of just the small portion actually assessed.

To conduct a comprehensive statewide assessment one would need to either conduct a census (monitor all waters) or a sample survey (estimate the total from a monitored subset). The traditional approach for Section 305(b) assessments has been to compile results from programs based on targeted monitoring without understanding the inherent biases. These assessments also made assumptions as to how much of a waterbody a monitoring station represented. Often these assumptions were based on best professional judgement and could not be defended with actual data. The results of these assumptions were reported without any quantitative description of the uncertainty of the results.

The problem with the traditional approach based on targeted monitoring for Section 305(b) assessments is that it is not designed to address the objectives of report. One should look at the type of questions one needs answered and match those with the monitoring design.

Below are the types of questions that can be answered by targeted monitoring approach:

- What is the level of aquatic life use support in Woodland Creek?
- What are the levels of fecal coliforms in the most heavily used lakes in King County?
- What is the biological condition of Boise Creek downstream of the wastewater discharge?

Below are the types of questions that can be answered by sample survey monitoring approach:

- What is the level of aquatic life use support in the Chehalis River watershed?
- How many miles of streams fully support swimming in Washington State?
- How many lakes in Eastern Washington are impaired due to nutrients?
- What is the primary source of pollution in the Puget Lowlands Ecoregion?

A review of the questions answered from the different type of monitoring approaches shows that the sample survey approach should be used for the Section 305(b) report. In contrast, the objectives of preparing a Section 303(d) list of water requiring TMDLs are best met with a targeted monitoring approach. The Section 305(b) assessment could be designed to use both approaches by dividing the states into two subpopulations, one which is censused and the other which is assessed using sample surveys. These two subpopulations could then be combined for a statewide assessment.

EPA guidance for the Section 305(b) assessment now allows the use of the sample survey approach to estimate statewide numbers for the report. Sample surveys are intended to produce assessments of the condition of the entire resource when that resource cannot be subject to a complete census (monitoring of every waterbody). Sample surveys rely on the selection of monitoring sites that are representative of the resource.

The sample survey approach applies to two types of monitoring design. Both types of monitoring designs use in a stratified sampling method so that inferences can be made about other waters that the samples represent. These two types of monitoring designs are described below.

Random Sampling Design:

Stations are selected with a statistically random method within each stratum. Randomization in the site selection process is the only way to assure that sites are selected without bias. This approach is used to select stations for EPA's Regional Environmental Assessment and Monitoring Program (REMAP). This method is also known as the "probability-based design".

The random sampling design has three elements:

1. Every possible station (population) has a known probability of being selected for monitoring (sample).

2. The set of stations monitored (sample) is drawn by some method of random selection, or a systematic selection with a random start.

3. Estimates are made about the population from the sample.

The REMAP design uses a tiered grid approach for selection of stations and estimating probabilities. The sampling approach attempts to measure not only population variance, but also variance caused temporally or by the assessment indices. This type of design requires a large sampling network and a long-term commitment.

Advantages:

- Allows the making of defensible, unbiased estimates with a known confidence.

Limitations:

- Need to establish a new sampling network based on random design.
- Cannot use data collected by existing sampling network -- will have to wait for new sampling data to conduct assessments.
- High cost with traveling to remote stations that may have limited access.

Judgemental Design:

Judgemental selection of sites is based on the best professional judgement of the monitoring agency that the sites are representative of the target resource (e.g. subpopulation of waters). The method assumes that the stations selected represent all waters in a similar subpopulation (stratum). Stations from an existing sampling network are reviewed individually to determine the reasons why their locations were selected. Stations that were located because they represent a type of water within an area can be used in the assessment to represent other waters with similar characteristics. Stations that were located based on the identification of specific problems, like downstream of a specific discharge, are not used.

Advantages:

- All stations selected are accessible.
- Allows the making of estimates with a known confidence.
- Data collected by existing sampling network can be used -- will not have to wait for new sampling data to conduct assessments.
- Assessments can be made for any waterbody type (stream, lake or estuaries).

Limitations:

- Assumption that stations selected by judgement represent all waters in the stratum requires a strong defense.
- Statewide estimates may still be biased due to factors unknown to the monitoring agency selecting stations by best professional judgement.

Methods:

Data used in the Assessment:

The following data sources were used for the assessment:

- Ecology's Ambient Monitoring Program freshwater data from 1984-1996.
- Ecology's Ambient Montioring Program marine water data from 1984-1995.
- REMAP Report: Biological Assessment of Wadable Streams in the Coast Range Ecoregion and the Yakima River Basin (Merritt, 1997)
- Ecology's Lake Water Quality Assessment Program from years 1989 - 1995.
- EPA Report: Western Lakes Survey Phase 1 - Characteristics of Lakes in the Western United States (January 1987)
- USGS Reports: Trophic Classification of Washington Lakes using Reconnaisance Data (Water Supply Bulletin 57, 1985 and Water Supply Bulletin 43, 1976))
- Department of Health Annual Inventory of Commercial & Recreational Shellfish Areas (December 1994 Report)

Assessment Approach:

A combination of the sample survey approach and the census approach was used for the 1997 Section 305(b) assessment update.

Stations from both Ecology's Ambient Monitoring Program (AMP) and the Regional Environmental Monitoring and Assessment Program (REMAP) were selected for use in this assessment of streams and estuaries by the sample survey approach. The stations from AMP were selected by best professional judgement to represent the characteristics of similar waters in the area (judgemental design method) . The stations from REMAP were selected by true random design (probability-based design). Other routine ambient monitoring networks (e.g. Metro-King County) that may also represent characteristic monitoring suitable for the sample survey approach were not used in this assessment for lack of time, but could be used in future annual assessment updates.

Lakes were assessed using the sample survey approach. The three sources of data used were selected since they were not designed to specifically identify problems, but to monitor a range of lake trophic states across the state. Very few widespread lake surveys have been conducted in the state. In order to obtain a larger sample size for extrapolation, data from some historical reports were used.

Shellfish harvesting in estauries was assessed by the census approach. Since this use is assessed using fecal coliform data, the location where samples are taken should correspond to the areas where the use occurs. Most of Ecology's marine ambient monitoring stations are located away from the shoreline toward the middle of the waterbody. These stations simply do not well represent impacts to shellfish for harvesting.

The Department of Health shellfish commercial classification inventory was used to assess shellfish harvesting. Sampling conducted for this inventory does not focus only on problem areas, but tries to assess all areas where shellfish harvesting is important. Therefore, the inventory represents a balance of areas that are impaired with areas which are fully supporting the use. No extrapolation will be made to areas not classified.

Selection of Stations for Sample Survey Approach:

Selection at stations for the sample survey approach was based on the assumption that they represent a specific water type and had data collected routinely year round. To reduce the bias introduced by seasonal sampling, sets of water column data that represent a partial year were not used for representing a stratum. Since some routine samples are not collected due to inclement weather, few stations have a full 12 months of sampling. Only stations with at least nine months of a year of data sampled at the same frequency (e.g. monthly) were used for the assessment. However, the habitat measures from the REMAP sampling were used for assessment of that use.

The assumption that extrapolation of nonrandomly selected stations is representative of the strata population was tested. The data on conventional parameters collected in the REMAP program (probability-based design) was used to make assessments and then compared to an assessment of similar data collected by AMP (judgmental design). Comparisons of the two data sets gives an estimate of the differecnes between the two sample survey design methods.

Water quality data collected as part of the REMAP project was assessed for the overall aquatic life use. Only those eight stations that were sampled more than four times were used for the assessment. The parameters used for the asssessment were temperature, dissolved oxygen, pH and ammonia and were collected in the seasonal period from May through October. These stations only represent the small stream startum in the Coast Range Ecoregion. Data from the eight stations collected by AMP in the same stratum using the same parameters and seasonal period were assessed in the same manner for overall aquatic life use. The results of assessment of the two designs were analysed using a contingency table for comparing proportions (Zar, 1984 - Chapter 22.10- page 395).

Sample Stratification:

Selected stations will be stratified by ecoregion and/or waterbody type to represent subpopulations of the target resource (strata). Strata with no representative stations were not assessed.

The following ecoregions defined by EPA were used to first stratify streams and lakes:

Ecoregion #1: Coast Range
Ecoregion #2: Puget Lowlands
Ecoregion #3: Willamette Valley (Clark County Area)
Ecoregion #4: Cascades (includes the Olympic Mountains)
Ecoregion #6: East Cascades and Foothills
Ecoregion #7: Columbia Basin
Ecoregion #8: Northern Rockies (Pend Oreille County Area)
Ecoregion #9: Blue Mountains (Asotin County Area)

Within each of these ecoregions, streams were further stratified into the following subpopulations:

1. "Large streams" - defined as those reaches that are shown with double-banked cartographic features in the Washington Rivers Information System (WARIS) GIS coverage .
2. "Small streams" - defined as those reaches that are in the coverage as a single line.

Within each of these ecoregions, lakes were further stratified into the following subpopulations:

1. "Small lakes" - defined as lakes less than 20 acres in size measured from the WARIS GIS coverage.
2. "Medium lakes" - defined as lakes between 20 and 100 acres in size
3. "Large lakes" - defined as lakes over 100 acres in size

Estuary areas were stratified into the following subpopulations:

1. Deep, well-mixed open water areas
2. Somewhat protected channels and passages
3. Bays, inlets and harbors

Estuary strata were defined using the existing waterbody identification boundaries and the judgement of Ecology's marine ambient monitoring staff documented in the memo from Jan Newton dated May 12, 1994. Waters overlying shallower depths will be included in the stratum of water contiguous to it. For example, no separate stratum will be made for shallower shoreline areas adjacent to deep water with monitored stations.

Assessments of Specific Uses:

Aquatic Life and Contact Recreation Uses:
Acceptable data from the selected station selected were used to assess the support or impairment of applicable uses with the exceedance frequency and terms recommended in EPA guidance. If 25% or greater of the data exceed any one criterion, support of the specific use was considered "poor". If more than 11% but less than 25% of the data exceed the criterion, support of the specific use was assessed as "fair". If 10% or less of the data exceed the criterion, support of the use was considered "good".

EPA guidance requests that an overall “Aquatic Life “ use be reported even though the specific use is not designated in state water quality standards. The overall “Aquatic Life” use support assessments were rolled up from assessments of the related individual designated uses classified in the standards. If one or more of the related individual uses assessed at a station were identified as fair or poor, the overall aquatic life use at the station were considered impaired. If all the uses assessed at a station were identified as good, then the overall aquatic life use at the station would be considered as good.

Shellfish Harvesting Use:
The Department of Health commercial and recreational shellfish classification inventory was used to assess shellfish harvesting. Classified areas were assessed from the latest shellfish inventory report (December 1994). Many areas are classified based on assumed risk and not sanitary surveys. For example, many areas around permitted discharges are classified as "prohibited" without sampling data. No assessment extrapolation will be made to areas not classified.

"Prohibited" commercial shellfish areas and “Closed” recreational shellfish beaches were assessed as "poor" for the support of the shellfish harvesting use. "Restricted" and "Conditionally Approved" commercial shellfish areas and “Conditional” recreational shellfish beaches were assessed as "fair". "Approved" commercial shelfish areas and “Open” recreational shellfish beaches were assessed as "good". Harvesting restrictions due to biotoxins were not included in the assessment since these are not likely human-caused impairments.

Aesthetic Enjoyment Use:
Most of the monitoring conducted by Ecology for lakes involves the assessment of trophic state. The characteristic use most directly related to trophic status is aesthetic enjoyment. This use is highly value laden and therefore difficult to assess. To derive an assessment, the assumption is made that at least some of a lake's users would find a eutrophic lake aesthetically impaired and that most users would find a hyper-eutrophic lake impaired.

"Hypereutrophic" lakes will be assessed as having "poor" support of aesthetic enjoyment. "Eutrophic" lakes will be considered to have "fair" support of aesthetics. "Mesotrophic" and "Oligiotrophic" are to be assessed as having "good" aesthetics. Lakes with trophic state index values which fall on the borderline and are considered "meso-eutrophic" will be assessed as having a "good" support of aesthetic enjoyment.

Wildlife Habitat Use:

Information from the REMAP report (Merril, 1997) was used to assess the designated use of wildlife habitat. Wildlife habitat is defined in the state water quality standards to include aquatic habitat, and not just terrestrial habitat. In the REMAP report, a habitat quality score was assigned by combining 5 metrics. The habitat quality score represents the relative comparison to reference sites. Habitat quality scores are available for only small streams strata in only 3 ecoregions. Waters in other strata were not assessed for the support of wildlife habitat use. Scores of 90 to 100 were assessed as having "good" habitat. Scores between 75 and 90 were considered to have "fair" habitat. Scores of 75 and lower were assessed as "poor" habitat.

Fish Consumption:
The criteria from the National Toxics Rule (40 CFR 131) were used along with metals data collected by AMP to assess the use of consuming fish tissue. The criteria specified for a one-per-million carcinogenic risk to human health for the consumption of organisms only were used. If 25% or greater of the data exceed any one criterion, support of the fish consumption use was assessed as "poor". If more than 11% but less than 25% of the data exceed the criterion, support of the use was considered "fair". If less than 10% of the data exceed the criterion, support of the use was considered "good".

Overall Use Support:
Individual use support assessments from each station were rolled up into an overall assessment according to EPA guidance. If one or more uses assessed at a station were identified as fair or poor, the uses at the station were considered impaired overall. If all uses asssessed at a station were identified as good, the uses at the station would be considered as good and fully supporting all uses overall.

Overall use support assessment of estuary areas were made by combining the census from the shellfish inventory with the extrapolated assessment of the remaining uses. The size asssessed by extrapolation was that area remaining after subtracting the size assessed from the shellfish inventory from the total size of the estuaries. The overall estuary assessment was then made by adding that area assessed by the shelfish inventory to the remaining area assessed by extrapolation of the AMP stations.

Inferring Statewide Estimates:

The total size of each stratum was measured by intersecting the EPA's Ecoregion coverage from the WARIS GIS coverage at the 1:100K scale. Line features identified as centerlines to double banked features (code 999) were defined as "Large stream" reaches. Line features identified as streams (code 412) and braided streams (code 413) were identified as "Small streams". There were no intermittent streams (code 610) in the coverage. The total size of the estauary strata was taken from the waterbody boundary delineations overlaid on the shoreline from the WARIS coverage.

Statewide estimates of water quality conditions were estimated by use of the proportion of stations assessed for each stratum. These proportions were then applied to the total size of the stratum derived from the GIS analysis. Uncertainty of the estimates for each startum were made at the 90% confidence limits for the sample proportion using a relationship between the F distribution and the binomial distribution. The confidence limits on the proportion were extrapolated using measured population size for each stratum. Assessments were extrapolated for individual use support, overall use support, causes of use impairments and possible sources of pollution causing the use impairments.

Below is a stepwise example of how an assessment was used to infer a statewide estimate using the example stratum of "Large streams in the Puget Lowlands Ecoregion".

Step 1. Measure total population size of the stratum - Using GIS, intersect the ecoregion boundary and double-banked stream polygons with the coverage hydro layer. Sum the linear miles. - Assume 397 miles for example.

Step 2. Assess data from stations in the stratum using EPA guidelines. Assume 9 stations out of 19 sampled are in “Good” condition.

Step 3. Extrapolate the assessment to stratum population using the proportion represented by the assessed stations. The example data would estimate 47% or 188 miles are in “Good” condition.

Step 4. Estimate the uncertainty of the inference using the 90% confidence limits for the assessed proportions. Applying the statistical equation (Zar, 1984 - Chapter 22.3, page 378) to the example sample data would estimate the lower confidence level as 117 miles (29%) and the upper confidence level as 202 miles (51%).

Step 5. Estimate statewide assessments for streams, lakes, and estuaries by summing estimates for all strata.

Causes of Use Impairment and Possible Sources of Pollution:

EPA also requires statewide estimates of the causes of use impairment and the possible sources of pollution causing those impairments. Both the causes and the sources are identified for each station assessed as having a use impairment. No causes or sources were identified for waters fully supporting their uses and assessed as “Good”. Causes and sources identified for each station were extrapolated in the same manner as the use support assessments.

The causes are described as one of twenty-seven categories used by EPA for the national report depending on the parameter that was exceeding the criteria. For example, exceedance of Copper, Zinc and Mercury criteria were rolled up into the “Metals” cause category for the report. The pollution sources will be described as one of 10 categories now used by EPA for the national

report. EPA had previously defined 57 pollution source categories in guidance for past 305(b) reports. A description of the EPA pollution source categories appears in the table below.

Possible pollution sources were identified by the best professional judgement of staff from EILS and the Regional Offices. Due to their field presence, these staff have the most local knowledge of impacts to water quality. Stations for which no judgement was made were identified as "unknown sources" for the statewide extrapolation of sample data.

Since EPA categories for sources include natural conditions, the assessment identified use impairments caused by natural conditions. For example, a eutrophic lake can be assessed as having fair support of aesthetic enjoyment due to natural conditions. This assessment would then be extrapolated by proportion to other lakes not sampled in the stratum.

Description of the EPA Pollution Source Categories

Source Category	Description of Sources
Industrial Point Sources	NPDES permitted discharge of industrial wastewater
Municipal Point Sources	NPDES permitted discharge of domestic wastewater
Combined Sewer Overflows	Sanitary sewer overflows due to excessive stormwater infiltrating the system
Stormwater Runoff	Runoff from urbanized areas
Septic Tanks	On-site sanitary wastewater treatment systems
Agriculture	Crop production, pasture land, feedlots, aquaculture, animal holding and management areas, manure lagoons, etc.
Silviculture (Forest Practices)	Harvesting, restoration, residue management, forest management, road construction and maintenance, etc.
Construction	Highway, road, or bridge building, land development, etc.
Resource Extraction	Surface mining, mine tailings, etc.
Land Disposal	Wastewater land application, landfills, hazardous waste, etc.
Hydromodification	Channelization, dredging, dam construction, flow regulation or modification, removal of riparian vegetation, streambank modification or destabilization, draining or filling of wetlands, etc.
Other Sources	Storage tank leaks, spills, in-place contaminants, recreational activities, upstream impoundment, etc.
Natural Sources	Use impairment is not human-caused. For example, surface heating in estuaries resulting from solar radiation can cause exceedance of temperature criteria.
Unknown Sources	A pollution source could not be identified

Results:

Size of Streams Assessed by Ecoregion and Type

Ecoregion (#)	Stream Type	Size (miles)	Number of Stations Assessed
Coast Range (1)	Small	6,122.15	56
	Large	252.10	9
	Total	6,374.25	65
Puget Lowlands (2)	Small	7,553.30	57
	Large	397.53	19
	Total	7,950.83	76
Willamette Valley (3)	Small	568.42	6
	Large	112.50	2
	Total	680.92	8
Cascades (4)	Small	17,481.64	11
	Large	289.28	7
	Total	17,770.92	18
East Cascades and Foothills (6)	Small	3,222.28	4
	Large	26.35	3
	Total	3,248.63	7
Columbia Basin (7)	Small	24,401.20	30
	Large	944.11	27
	Total	25,345.31	57
Northern Rockies (8)	Small	7,680.59	13
	Large	215.59	6
	Total	7,896.18	19
Blue Mountains (9)	Small	1,122.84	0
	Large	49.55	1
	Total	1,172.39	1
Total of All Ecoregions	Small	68,152.42	177
	Large	2,287.01	74
	Overall Total	70,439.43	251

Size of Estuaries Assessed by Type

Estuary Type	Size (square miles)	Number of Stations Assessed
Deep, Well-mixed Open Water Areas	1,886.76	9
Somewhat Protected Channels and Passages	541.64	20
Bays, Inlets, and Harbors	475.46	42
Total of All Types	2,903.86	71

Size of Lakes Assessed by Ecoregion and Type

Ecoregion (#)	Lake Type	Size (acres)	Number of Lakes Assessed
Coast Range (1)	Small	545.93	1
	Medium	726.50	9
	Large	23,008.36	10
	Total	24,280.79	20
Puget Lowlands (2)	Small	4,369.50	71
	Medium	9,110.09	158
	Large	56,568.14	80
	Total	70,047.73	309
Willamette Valley (3)	Small	457.50	0
	Medium	906.94	6
	Large	3,745.35	2
	Total	5,109.79	8
Cascades (4)	Small	6,500.12	82
	Medium	8,792.37	78
	Large	52,241.95	41
	Total	67,534.44	201
East Cascades and Foothills (6)	Small	128.67	0
	Medium	362.84	2
	Large	2,581.20	1
	Total	3,072.71	3
Columbia Basin (7)	Small	7,424.59	26
	Medium	12,398.87	139
	Large	43,776.59	83
	Total	63,600.05	248
Northern Rockies (8)	Small	1,466.92	7
	Medium	2,649.22	44
	Large	11,506.99	17
	Total	15,623.13	68
Blue Mountains (9)	Small	8.19	0
	Medium	0	0
	Large	0	0
	Total	8.19	0
Total of All Ecoregions	Small	20,901.42	187
	Medium	34,946.83	436
	Large	193,428.58	234
	Overall Total	249,276.83	857

Percent of Streams Assessed by Designated Use and Type

Designated Use	Stream Type		
	Large	Small	Total All Types
Aquatic Life	100%	98%	98%
Fish Migration	100%	98%	98%
Fish Spawning	100%	98%	98%
Salmon Spawning	100%	98%	98%
Wildlife Habitat	0	9%	9%
Primary Contact Receration	100%	98%	98%
Secondary Contact Recreation	100%	98%	98%
Fish Consumption	84%	84%	84%
Aesthetic Enjoyment	0	0	0
Overall Use	100%	98%	98%

Percent of Estuaries Assessed by Designated Use and Type

Designated Use	Estuary Type			
	Deep Open Water	Channels and Passages	Bays, Inlets, & Harbors	Total All Types
Aquatic Life	100%	100%	100%	100%
Fish Migration	100%	100%	100%	100%
Fish Spawning	100%	100%	100%	100%
Clam Spawning	100%	100%	100%	100%
Crab Spawning	100%	100%	100%	100%
Primary Contact Recreation	100%	100%	100%	100%
Secondary Contact Receration	100%	100%	100%	100%
Shellfish Harvetsing	1%	9%	77%	15%
Fish Consumption	0	0	0	0
Overall Use	100%	100%	100%	100%

Percent of Lakes Assessed by Designated Use and Type

Designated Use	Lake Type			
	Large	Medium	Small	Total All Types
Aesthetic Enjoyment	100%	100%	97%	99%
Aquatic Life	0	0	0	0
Fish Migration	0	0	0	0
Fish Spawning	0	0	0	0
Salmon Spawning	0	0	0	0
Wildlife Habitat	0	0	0	0
Primary Contact Recreation	0	0	0	0
Secondary Contact Recreation	0	0	0	0
Fish Consumption	0	0	0	0
Overall Use	100%	100%	97%	99%

Overall Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	571.8	819.8	849.9
	Fair	510.0	707.9	737.0
	Poor	538.9	759.3	788.9
Small Streams	Good	19,243.0	27,343.9	27,507.5
	Fair	9,695.3	11,528.0	11,654.2
	Poor	19,648.7	28,157.7	28,322.1
Cascade Range Ecoregion	Good	1,577.1	2,189.2	2,238.5
	Fair	1,468.7	1,995.9	2,044.1
	Poor	1,577.1	2,189.2	2,238.5
Puget Lowlands Ecoregion	Good	2,032.6	2,838.6	2,894.1
	Fair	1,464.8	1,876.1	1,925.5
	Poor	2,238.8	3,236.1	3,292.9
Willamette Valley Ecoregion	Good	70.2	94.7	107.4
	Fair	208.1	340.5	357.7
	Poor	163.3	245.7	262.5
Cascades Ecoregion	Good	8,261.4	16,099.0	16,148.8
	Fair	1,435.4	1,630.6	1,681.0
	Poor	31.2	41.3	50.9
East Cascades and Foothills Ecoregion	Good	1,339.1	2,434.3	2,466.1
	Fair	611.1	805.6	838.0
	Poor	4.5	8.8	14.0
Columbia Basin Ecoregion	Good	2,326.1	2,649.9	2,713.4
	Fair	3,178.9	3,743.0	3,816.4
	Poor	10,696.7	18,952.4	19,041.1
Northern Rockies Ecoregion	Good	1,418.9	1,808.4	1,857.1
	Fair	1,442.3	1,844.3	1,893.4
	Poor	2,693.7	4,243.5	4,300.7
Blue Mountains Ecoregion	Good	11.9	49.6	49.6
	Fair	0	0	0
	Poor	0	0	0
Total of All Streams Statewide	Good	19,845.7	28,163.7	28,330.0
	Fair	10,255.5	12,235.9	12,365.5
	Poor	20,222.45	28,917.0	29,084.0

Overall Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	25%	**35%**	37%
	Fair	22%	**31%**	32%
	Poor	24%	**33%**	34%
Small Streams	Good	29%	**41%**	41%
	Fair	14%	**17%**	17%
	Poor	29%	**42%**	42%
Cascade Range Ecoregion	Good	25%	**34%**	35%
	Fair	23%	**31%**	32%
	Poor	25%	**34%**	35%
Puget Lowlands Ecoregion	Good	26%	**36%**	36%
	Fair	18%	**24%**	24%
	Poor	28%	**41%**	41%
Willamette Valley Ecoregion	Good	10%	**14%**	16%
	Fair	31%	**50%**	53%
	Poor	24%	**36%**	39%
Cascades Ecoregion	Good	46%	**91%**	91%
	Fair	8%	**9%**	9%
	Poor	0%	**0.2%**	0.3%
East Cascades and Foothills Ecoregion	Good	41%	**75%**	76%
	Fair	19%	**25%**	26%
	Poor	0%	**0.3%**	0.4
Columbia Basin Ecoregion	Good	9%	**10%**	11%
	Fair	13%	**15%**	15%
	Poor	42%	**75%**	75%
Northern Rockies Ecoregion	Good	18%	**23%**	24%
	Fair	18%	**23%**	24%
	Poor	34%	**54%**	54%
Blue Mountains Ecoregion	Good	24%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Total of All Streams Statewide	Good	29%	**41%**	41%
	Fair	15%	**18%**	18%
	Poor	29%	**42%**	42%

Overall Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	436.9	**619.9**	646.6
	Fair	541.9	**826.5**	854.5
	Poor	313.0	**413.2**	437.1
Channels and Passages	Good	137.2	**221.4**	236.1
	Fair	125.5	**196.8**	211.3
	Poor	52.9	**73.8**	85.0
Bays, Inlets, and Harbors	Good	10.1	**18.0**	24.0
	Fair	23.0	**41.1**	48.3
	Poor	26.5	**48.8**	56.0
Total of All Estuaries Statewide	Good	604.1	**859.2**	890.2
	Fair	708.3	**1,064.4**	1,096.5
	Poor	411.2	**535.9**	563.0

Overall Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	23%	**33%**	35%
	Fair	29%	**44%**	46%
	Poor	17%	**22%**	24%
Channels and Passages	Good	28%	**45%**	48%
	Fair	26%	**40%**	43%
	Poor	11%	**15%**	17%
Bays, Inlets, and Harbors	Good	9%	**17%**	22%
	Fair	21%	**38%**	45%
	Poor	25%	**45%**	52%
Total of All Estuaries Statewide	Good	25%	**35%**	36%
	Fair	29%	**43%**	45%
	Poor	17%	**22%**	23%

Overall Use Support
Acres of Assessed Lakes

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (acres)	Upper 90% Conf. Limit
Large Lakes	Good	77,132	**129,084**	129,350
	Fair	41,916	**53,862**	54,115
	Poor	9,823	**10,483**	10,612
Medium Lakes	Good	12,825	**20,546**	20,664
	Fair	8,653	**11,670**	11,784
	Poor	2,473	**2,731**	2,797
Small Lakes	Good	7,781	**12,852**	12,940
	Fair	4,241	**5,471**	5,553
	Poor	1,758	**1,984**	2,040
Cascade Range Ecoregion	Good	9,696	**16,429**	16,522
	Fair	4,446	**5,551**	5,636
	Poor	2,048	**2,301**	2,360
Puget Lowlands Ecoregion	Good	27,084	**44,605**	44,769
	Fair	17,561	**23,678**	23,840
	Poor	1,669	**1,764**	1,818
	Good	131	**151**	168
	Fair	2,135	**4,199**	4,225
	Poor	264	**302**	325
Cascades Ecoregion	Good	31,597	**60,329**	60,431
	Fair	4,278	**4,657**	4,743
	Poor	2,395	**2,548**	2,613
East Cascades and Foothills Ecoregion	Good	1,355	**2,763**	2,779
	Fair	155	**181**	199
	Poor	0	**0**	2
Columbia Basin Ecoregion	Good	18,013	**25,393**	25,552
	Fair	20,305	**30,133**	30,295
	Poor	7,067	**8,074**	8,182
Northern Rockies Ecoregion	Good	6,967	**12,812**	12,874
	Fair	2,178	**2,601**	2,662
	Poor	189	**210**	229
Blue Mountains Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Total of All Lakes Statewide	Good	97,952	**162,482**	162,786
	Fair	54,988	**71,002**	71,292
	Poor	14,179	**15,199**	15,353

Overall Use Support
Percent of Assessed Lakes

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Lakes	Good	40%	**67%**	67%
	Fair	22%	**28%**	28%
	Poor	5%	**5%**	5%
Medium Lakes	Good	37%	**59%**	59%
	Fair	25%	**33%**	34%
	Poor	7%	**8%**	8%
Small Lakes	Good	38%	**63%**	64%
	Fair	21%	**27%**	27%
	Poor	9%	**10%**	10%
Cascade Range Ecoregion	Good	40%	**68%**	68%
	Fair	18%	**23%**	23%
	Poor	8%	**9%**	10%
Puget Lowlands Ecoregion	Good	39%	**64%**	64%
	Fair	25%	**34%**	34%
	Poor	2%	**3%**	3%
Willamette Valley Ecoregion	Good	3%	**3%**	4%
	Fair	46%	**90%**	91%
	Poor	6%	**6%**	7%
Cascades Ecoregion	Good	47%	**89%**	89%
	Fair	6%	**7%**	7%
	Poor	4%	**4%**	4%
East Cascades and Foothills Ecoregion	Good	46%	**94%**	94%
	Fair	5%	**6%**	7%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	28%	**40%**	40%
	Fair	32%	**47%**	48%
	Poor	11%	**13%**	13%
Northern Rockies Ecoregion	Good	44%	**82%**	82%
	Fair	14%	**17%**	17%
	Poor	1%	**1%**	1%
Blue Mountains Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Total of All Lakes Statewide	Good	39%	**65%**	65%
	Fair	22%	**29%**	29%
	Poor	6%	**6%**	6%

Aquatic Life Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	760.8	**1,203.3**	1,234.4
	Fair	541.8	**752.2**	781.8
	Poor	270.3	**331.5**	354.1
Small Streams	Good	25,909.2	**42,671.3**	42,831.2
	Fair	11,112.2	**13,486.7**	13,620.6
	Poor	9,246.4	**10,871.6**	10,994.9
Cascade Range Ecoregion	Good	2,879.6	**5,500.9**	5,536.1
	Fair	709.1	**837.3**	872.9
	Poor	28.4	**36.0**	45.0
Puget Lowlands Ecoregion	Good	3,169.1	**5,434.6**	5,488.1
	Fair	1,526.9	**1,954.6**	2,004.7
	Poor	497.2	**561.6**	592.0
Willamette Valley Ecoregion	Good	228.1	**379.0**	396.0
	Fair	167.0	**245.7**	262.5
	Poor	43.5	**56.2**	66.6
Cascades Ecoregion	Good	8,312.0	**16,140.3**	16,189.6
	Fair	1,448.1	**1,630.6**	1,681.0
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,332.9	**3,239.9**	3,243.4
	Fair	5.2	**8.8**	14.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	6,833.5	**9,513.6**	9,613.0
	Fair	5,120.1	**6,536.0**	6,626.1
	Poor	6,718.1	**9,295.7**	9,394.7
Northern Rockies Ecoregion	Good	2,431.3	**3,616.7**	3,674.1
	Fair	2,140.7	**3,025.9**	3,082.0
	Poor	1,045.0	**1,253.5**	1,296.1
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	26,702.1	**43,874.6**	44,037.5
	Fair	11,694.4	**14,238.9**	14,376.2
	Poor	9,534.6	**11,203.1**	11,328.3

Aquatic Life Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	33%	**53%**	54%
	Fair	24%	**33%**	34%
	Poor	12%	**14%**	15%
Small Streams	Good	39%	**64%**	64%
	Fair	17%	**20%**	20%
	Poor	14%	**16%**	16%
Cascade Range Ecoregion	Good	45%	**86%**	87%
	Fair	11%	**13%**	14%
	Poor	01%	**1%**	1%
Puget Lowlands Ecoregion	Good	40%	**68%**	69%
	Fair	19%	**25%**	25%
	Poor	6%	**7%**	7%
Willamette Valley Ecoregion	Good	33%	**56%**	58%
	Fair	25%	**36%**	39%
	Poor	6%	**8%**	10%
Cascades Ecoregion	Good	47%	**91%**	91%
	Fair	8%	**9%**	9%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	41%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	27%	**38%**	38%
	Fair	20%	**26%**	26%
	Poor	27%	**37%**	37%
Northern Rockies Ecoregion	Good	31%	**46%**	47%
	Fair	27%	**38%**	39%
	Poor	13%	**16%**	16%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Total of All Streams Statewide	Good	39%	**63%**	64%
	Fair	17%	**21%**	21%
	Poor	14%	**16%**	16

Aquatic Life Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	449.5	**628.9**	655.9
	Fair	556.7	**838.6**	866.8
	Poor	323.1	**419.3**	443.3
Channels and Passages	Good	155.3	**243.7**	259.1
	Fair	142.3	**216.6**	231.9
	Poor	61.2	**81.2**	92.9
Bays, Inlets, and Harbors	Good	66.6	**90.6**	102.5
	Fair	119.7	**181.1**	195.4
	Poor	130.8	**203.8**	218.2
Total of All Estuaries Statewide	Good	695.4	**963.2**	996.5
	Fair	837.9	**1,236.3**	1,271.1
	Poor	541.5	**704.3**	734.8

Aquatic Life Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	24%	**33%**	35%
	Fair	30%	**44%**	46%
	Poor	17%	**22%**	23%
Channels and Passages	Good	29%	**45%**	48%
	Fair	26%	**40%**	43%
	Poor	11%	**15%**	17%
Bays, Inlets, and Harbors	Good	14%	**19%**	22%
	Fair	25%	**38%**	41%
	Poor	28%	**43%**	46%
Total of All Estuaries	Good	24%	**33%**	34%
	Fair	29%	**43%**	44%
	Poor	19%	**24%**	25%

Fish Migration Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	981.0	**1,836.5**	1,860.9
	Fair	305.5	**379.7**	403.5
	Poor	58.6	**70.9**	82.8
Small Streams	Good	30,853.8	**58,001.1**	58,114.3
	Fair	6,248.7	**7,004.2**	7,106.8
	Poor	1,909.9	**2,024.3**	2,082.3
Cascade Range Ecoregion	Good	2,832.2	**6,346.2**	6,352.8
	Fair	21.4	**28.0**	36.1
	Poor	0	**0**	2.3
Puget Lowlands Ecoregion	Good	3,598.0	**6,848.9**	6,888.3
	Fair	617.1	**704.4**	738.0
	Poor	354.9	**397.5**	423.6
Willamette Valley Ecoregion	Good	278.6	**529.9**	543.9
	Fair	111.6	**151.0**	165.8
	Poor	0	**0**	2.3
Cascades Ecoregion	Good	8,321.6	**16,181.7**	16,230.3
	Fair	1,413.8	**1,589.2**	1,639.1
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,332.9	**3,239.9**	3,243.4
	Fair	5.2	**8.8**	14.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	10,862.1	**19,372.0**	19,458.7
	Fair	3,617.4	**4,311.6**	4,389.3
	Poor	1,512.0	**1,661.7**	1,713.4
Northern Rockies Ecoregion	Good	3,681.4	**7,269.4**	7,300.1
	Fair	521.8	**590.8**	621.9
	Poor	28.3	**35.9**	44.9
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	31,871.2	**59,837.5**	59,953.4
	Fair	6,578.0	**7,383.9**	7,489.1
	Poor	1,977.8	**2,095.2**	2,154.1

Fish Migration Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	43%	**80%**	81%
	Fair	13%	**17%**	18%
	Poor	3%	**3%**	4%
Small Streams	Good	46%	**87%**	87%
	Fair	9%	**10%**	11%
	Poor	3%	**3%**	3%
Cascade Range Ecoregion	Good	44%	**100%**	100%
	Fair	0%	**0%**	1%
	Poor	0%	**0%**	0%
Puget Lowlands Ecoregion	Good	45%	**86%**	87%
	Fair	8%	**9%**	9%
	Poor	4%	**5%**	5%
Willamette Valley Ecoregion	Good	41%	**78%**	80%
	Fair	16%	**22%**	24%
	Poor	0%	**0%**	0%
Cascades Ecoregion	Good	47%	**91%**	91%
	Fair	8%	**9%**	9%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	41%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	43%	**76%**	77%
	Fair	14%	**17%**	17%
	Poor	6%	**7%**	7%
Northern Rockies Ecoregion	Good	47%	**92%**	92%
	Fair	7%	**7%**	8%
	Poor	0%	**0%**	1%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	5%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	46%	**86%**	86%
	Fair	9%	**11%**	11%
	Poor	3%	**3%**	3%

Fish Migration Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	844.9	**1,677.1**	1,694.6
	Fair	172.8	**209.6**	228.2
	Poor	0	**0**	2.3
Channels and Passages	Good	228.9	**460.4**	471.0
	Fair	41.1	**54.2**	64.2
	Poor	19.8	**27.1**	34.8
Bays, Inlets, and Harbors	Good	202.4	**452.8**	458.6
	Fair	7.1	**11.3**	16.9
	Poor	7.1	**11.3**	16.9
Total of All Estuaries Statewide	Good	1,314.8	**2,590.3**	2,611.7
	Fair	232.8	**275.1**	296.4
	Poor	30.3	**38.4**	47.6

Fish Migration Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	45%	**89%**	90%
	Fair	9%	**11%**	12%
	Poor	0%	**0%**	0%
Channels and Passages	Good	42%	**85%**	87%
	Fair	8%	**10%**	12%
	Poor	4%	**5%**	6%
Bays, Inlets, and Harbors	Good	43%	**95%**	96%
	Fair	1%	**2%**	4%
	Poor	1%	**2%**	4%
Total of All Estuaries Statewide	Good	45%	**89%**	90%
	Fair	8%	**9%**	10%
	Poor	1%	**1%**	2%

Fish Spawning Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	874.7	**1,498.8**	1,528.2
	Fair	468.6	**626.5**	654.7
	Poor	136.4	**161.8**	178.6
Small Streams	Good	27,654.7	**47,594.1**	47,744.9
	Fair	8,899.2	**10,403.4**	10,524.6
	Poor	7,857.9	**9,032.1**	9,146.4
Cascade Range Ecoregion	Good	2,953.9	**6,290.2**	6,301.7
	Fair	71.6	**84.0**	97.0
	Poor	0	**0**	2.3
Puget Lowlands Ecoregion	Good	3,563.2	**6,716.4**	6,757.8
	Fair	599.8	**683.5**	716.6
	Poor	488.1	**551.0**	581.1
Willamette Valley Ecoregion	Good	278.6	**529.9**	543.9
	Fair	111.6	**151.0**	165.8
	Poor	0	**0**	2.3
Cascades Ecoregion	Good	8,321.6	**16,181.7**	16,230.3
	Fair	1,413.8	**1,589.2**	1,639.1
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,332.9	**3,239.9**	3,243.4
	Fair	5.2	**8.8**	14.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	7,982.2	**11,841.8**	11,944.1
	Fair	4,828.0	**6,078.3**	6,166.2
	Poor	5,664.3	**7,425.3**	7,518.9
Northern Rockies Ecoregion	Good	2,708.3	**4,243.5**	4,300.7
	Fair	1,816.7	**2,435.1**	2,488.5
	Poor	1,018.5	**1,217.6**	1,259.7
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	28,558.9	**49,092.9**	49,246.5
	Fair	9,406.5	**11,029.9**	11,154.3
	Poor	8,014.4	**9,193.8**	9,309.3

Fish Spawning Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	38%	**66%**	67%
	Fair	20%	**27%**	29%
	Poor	6%	**7%**	8%
Small Streams	Good	41%	**71%**	71%
	Fair	13%	**16%**	16%
	Poor	12%	**13%**	14%
Cascade Range Ecoregion	Good	46%	**99%**	99%
	Fair	1%	**1%**	2%
	Poor	0%	**0%**	0%
Puget Lowlands Ecoregion	Good	45%	**84%**	85%
	Fair	8%	**9%**	9%
	Poor	6%	**7%**	7%
Willamette Valley Ecoregion	Good	41%	**78%**	80%
	Fair	16%	**22%**	24%
	Poor	0%	**0%**	0%
Cascades Ecoregion	Good	47%	**91%**	91%
	Fair	8%	**9%**	9%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	41%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	31%	**47%**	47%
	Fair	19%	**24%**	24%
	Poor	22%	**29%**	30%
Northern Rockies Ecoregion	Good	34%	**54%**	54%
	Fair	23%	**31%**	32%
	Poor	13%	**15%**	16%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	5%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	41%	**71%**	71%
	Fair	14%	**16%**	16%
	Poor	12%	**13%**	13%

Fish Spawning Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	792.9	**1,467.5**	1,490.7
	Fair	172.8	**209.6**	228.2
	Poor	172.8	**209.6**	228.2
Channels and Passages	Good	215.6	**406.2**	419.3
	Fair	61.2	**81.2**	92.9
	Poor	41.1	**54.2**	64.2
Bays, Inlets, and Harbors	Good	182.3	**336.6**	349.2
	Fair	75.6	**104.4**	116.9
	Poor	25.7	**34.8**	43.3
Total of All Estuaries Statewide	Good	1,215.5	**2,210.0**	2,239.6
	Fair	326.7	**395.3**	420.0
	Poor	251.6	**298.6**	320.7

Fish Spawning Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	42	**78**	79
	Fair	9	**11**	12
	Poor	9	**11**	12
Channels and Passages	Good	40	**75**	77
	Fair	11	**15**	17
	Poor	8	**10**	12
Bays, Inlets, and Harbors	Good	38	**71**	73
	Fair	16	**22**	25
	Poor	5	**7**	9
Total of All Estuaries Statewide	Good	42	**76**	77
	Fair	11	**14**	14
	Poor	9	**16**	11

Shellfish Spawning Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	792.9	**1,467.5**	1,490.7
	Fair	172.8	**209.6**	228.2
	Poor	172.8	**209.6**	228.2
Channels and Passages	Good	207.5	**379.1**	393.0
	Fair	79.9	**108.3**	121.2
	Poor	41.1	**54.2**	64.2
Bays, Inlets, and Harbors	Good	127.6	**197.1**	211.5
	Fair	116.0	**173.9**	188.1
	Poor	75.6	**104.4**	116.9
Total of All Estuaries Statewide	Good	1,163.1	**2,043.8**	2,075.5
	Fair	397.9	**491.9**	518.8
	Poor	306.1	**368.2**	392.2

Shellfish Spawning Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	42%	**78%**	79%
	Fair	9%	**11%**	12%
	Poor	9%	**11%**	12%
Channels and Passages	Good	38%	**70%**	73%
	Fair	15%	**20%**	22%
	Poor	8%	**10%**	12%
Bays, Inlets, and Harbors	Good	27%	**41%**	44%
	Fair	24%	**37%**	40%
	Poor	16%	**22%**	25%
Total of All Estuaries Statewide	Good	40%	**70%**	71%
	Fair	14%	**17%**	18%
	Poor	11%	**13%**	14%

Shellfish Harvesting Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Assessed Size (sq. miles)
Deep Open Water Areas	Good	**15.4**
	Fair	**1.3**
	Poor	**10.5**
Channels and Passages	Good	**16.5**
	Fair	**30.1**
	Poor	**3.1**
Bays, Inlets, and Harbors	Good	**253.3**
	Fair	**51.3**
	Poor	**62.9**
Total of All Estuaries Statewide	Good	**285.2**
	Fair	**82.7**
	Poor	**76.5**

Shellfish Harvesting Use Support
Percent of Assessed Estuaries

Strata	Rating	Percent of Assessed Size
Deep Open Water Areas	Good	**57%**
	Fair	**5%**
	Poor	**38%**
Channels and Passages	Good	**33%**
	Fair	**61%**
	Poor	**6%**
Bays, Inlets, and Harbors	Good	**69%**
	Fair	**14%**
	Poor	**17%**
Total of All Estuaries Statewide	Good	**64%**
	Fair	**19%**
	Poor	**17%**

Salmonid Spawning Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	760.8	**1,203.3**	1,234.4
	Fair	541.8	**752.3**	781.8
	Poor	270.3	**331.5**	354.1
Small Streams	Good	25,909.2	**42,671.3**	42,831.2
	Fair	11,112.2	**13,486.7**	13,620.6
	Poor	9,246.4	**10,871.6**	10,994.9
Cascade Range Ecoregion	Good	2,879.6	**5,500.9**	5,536.1
	Fair	709.1	**837.3**	872.9
	Poor	28.4	**36.0**	45.0
Puget Lowlands Ecoregion	Good	3,169.1	**5,434.6**	5,488.0
	Fair	1,526.9	**1,954.6**	2,004.7
	Poor	497.2	**561.6**	592.0
Willamette Valley Ecoregion	Good	228.1	**378.9**	396.0
	Fair	167.0	**245.7**	262.5
	Poor	43.5	**56.3**	66.6
Cascades Ecoregion	Good	8,312.0	**16,140.4**	16,189.6
	Fair	1,448.1	**1,630.6**	1,681.0
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,332.9	**3,239.9**	3,243.4
	Fair	5.2	**8.8**	14.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	6,833.5	**9,513.6**	9,613.0
	Fair	5,120.1	**6,536.0**	6,626.1
	Poor	6,718.1	**9,295.7**	9,394.7
Northern Rockies Ecoregion	Good	2,431.3	**3,616.7**	3,674.1
	Fair	2,140.7	**3,025.9**	3,082.0
	Poor	1,045.0	**1,253.5**	1,296.1
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	26,702.1	**43,874.6**	44,037.5
	Fair	11,694.4	**14,238.9**	14,376.2
	Poor	9,534.6	**11,203.1**	11,328.3

Salmonid Spawning Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	33%	**53%**	54%
	Fair	24%	**33%**	34%
	Poor	12%	**14%**	15%
Small Streams	Good	39%	**64%**	64%
	Fair	17%	**20%**	20%
	Poor	14%	**16%**	16%
Cascade Range Ecoregion	Good	45%	**86%**	87%
	Fair	11%	**13%**	14%
	Poor	0%	**1%**	1%
Puget Lowlands Ecoregion	Good	40%	**68%**	69%
	Fair	19%	**25%**	25%
	Poor	6%	**7%**	7%
Willamette Valley Ecoregion	Good	33%	**56%**	58%
	Fair	25%	**36%**	39%
	Poor	6%	**8%**	10%
Cascades Ecoregion	Good	47%	**91%**	91%
	Fair	8%	**9%**	9%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	41%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	27%	**38%**	38%
	Fair	20%	**26%**	26%
	Poor	27%	**37%**	37%
Northern Rockies Ecoregion	Good	31%	**46%**	47%
	Fair	27%	**38%**	39%
	Poor	13%	**16%**	16%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	5%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	39%	**63%**	64%
	Fair	17%	**21%**	21%
	Poor	14%	**16%**	16%

Wildlife Habitat Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Small Streams	Good	1,343.9	**1,785.6**	1,832.0
	Fair	1,560.7	**2,168.3**	2,216.9
	Poor	1,560.7	**2,168.3**	2,216.9
Cascade Range Ecoregion	Good	1,343.9	**1,785.6**	1,832.0
	Fair	1,560.7	**2,168.3**	2,216.9
	Poor	1,560.7	**2,168.3**	2,216.9
Puget Lowlands Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Willamette Valley Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Cascades Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
East Cascades and Foothills Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Columbia Basin Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Northern Rockies Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Blue Mountains Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Total of All Streams Statewide	Good	1,343.9	**1,785.6**	1,832.0
	Fair	1,560.7	**2,168.3**	2,216.9
	Poor	1,560.7	**2,168.3**	2,216.9

Wildlife Habitat Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Small Streams	Good	22%	**29%**	30%
	Fair	25%	**35%**	36%
	Poor	25%	**35%**	36%
Cascade Range Ecoregion	Good	22%	**29%**	30%
	Fair	25%	**35%**	36%
	Poor	25%	**35%**	36%
Puget Lowlands Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Willamette Valley Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Cascades Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Northern Rockies Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Blue Mountains Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Total of All Streams Statewide	Good	22%	**29%**	30%
	Fair	25%	**35%**	36%
	Poor	25%	**35%**	36%

Fish Consumption Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	628.0	**989.3**	1,017.8
	Fair	195.4	**238.4**	258.0
	Poor	487.5	**694.8**	722.5
Small Streams	Good	22,764.8	**38,285.1**	38,429.3
	Fair	0	**0**	2.3
	Poor	14,040.8	**18,831.7**	18,976.4
Cascade Range Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Puget Lowlands Ecoregion	Good	3,420.0	**6,213.0**	6,260.3
	Fair	0	**0**	2.3
	Poor	1,385.4	**1,737.8**	1,786.0
Willamette Valley Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Cascades Ecoregion	Good	8,393.3	**17,626.3**	17,641.4
	Fair	0	**0**	2.3
	Poor	128.5	**144.7**	161.2
East Cascades and Foothills Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	7.5	**26.4**	26.4
Columbia Basin Ecoregion	Good	8,399.4	**12,767.1**	12,869.6
	Fair	170.4	**188.8**	207.6
	Poor	8,231.6	**12,389.4**	12,491.9
Northern Rockies Ecoregion	Good	1,948.7	**2,668.0**	2,722.6
	Fair	0	**0**	2.3
	Poor	3,088.0	**5,228.2**	5,282.3
Blue Mountains Ecoregion	Good	0	**0**	2.3
	Fair	14.6	**49.6**	49.6
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	23,426.9	**39,274.4**	39,421.6
	Fair	217.9	**238.4**	259.4
	Poor	14,549.8	**19,526.4**	19,673.7

Fish Consumption Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	33%	**51%**	53%
	Fair	10%	**12%**	13%
	Poor	25%	**36%**	38%
Small Streams	Good	40%	**67%**	67%
	Fair	0%	**0%**	0%
	Poor	25%	**33%**	33%
Cascade Range Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Puget Lowlands Ecoregion	Good	43%	**78%**	79%
	Fair	0%	**0%**	0%
	Poor	17%	**22%**	22%
Willamette Valley Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Cascades Ecoregion	Good	47%	**99%**	99%
	Fair	0%	**0%**	0%
	Poor	1%	**1%**	1%
East Cascades and Foothills Ecoregion	Good	0%	**0%**	8%
	Fair	0%	**0%**	8%
	Poor	29%	**100%**	100%
Columbia Basin Ecoregion	Good	33%	**50%**	51%
	Fair	1%	**1%**	1%
	Poor	32%	**49%**	49%
Northern Rockies Ecoregion	Good	25%	**34%**	34%
	Fair	0%	**0%**	0%
	Poor	39%	**66%**	67%
Blue Mountains Ecoregion	Good	0%	**0%**	5%
	Fair	29%	**100%**	100%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	40%	**67%**	67%
	Fair	0%	**0%**	0%
	Poor	25%	**33%**	33%

Primary Contact Recreation Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	970.2	**1,797.9**	1,823.1
	Fair	200.4	**240.4**	260.3
	Poor	207.0	**248.7**	268.9
Small Streams	Good	24,061.9	**37,913.5**	38,078.4
	Fair	8,024.0	**9,247.6**	9,363.1
	Poor	15,197.6	**19,868.4**	20,020.7
Cascade Range Ecoregion	Good	2,425.0	**4,046.9**	4,096.5
	Fair	653.2	**765.3**	799.6
	Poor	1,217.0	**1,562.1**	1,606.9
Puget Lowlands Ecoregion	Good	2,114.2	**2,967.5**	3,023.4
	Fair	1,384.4	**1,736.3**	1,784.4
	Poor	2,257.6	**3,247.0**	3,303.8
Willamette Valley Ecoregion	Good	167.0	**245.7**	262.5
	Fair	135.5	**189.5**	205.3
	Poor	167.0	**245.7**	262.5
Cascades Ecoregion	Good	5,380.5	**17,770.9**	17,770.9
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,353.3	**2,443.1**	2,474.8
	Fair	618.6	**805.6**	838.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	5,931.1	**7,879.6**	7,974.8
	Fair	3,518.4	**4,175.8**	4,252.5
	Poor	8,626.3	**13,289.9**	13,392.3
Northern Rockies Ecoregion	Good	2,735.2	**4,308.2**	4,365.3
	Fair	1,435.0	**1,815.6**	1,864.4
	Poor	1,406.7	**1,772.4**	1,820.9
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	25,089.4	**39,711.4**	39,878.7
	Fair	8,241.8	**9,488.0**	9,605.0
	Poor	15,462.4	**20,117.2**	20,271.1

Primary Contact Recreation Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	42%	**79%**	80%
	Fair	9%	**11%**	11%
	Poor	9%	**11%**	12%
Small Streams	Good	36%	**57%**	57%
	Fair	12%	**14%**	14%
	Poor	23%	**30%**	30%
Cascade Range Ecoregion	Good	38%	**63%**	64%
	Fair	10%	**12%**	13%
	Poor	19%	**25%**	25%
Puget Lowlands Ecoregion	Good	27%	**37%**	38%
	Fair	17%	**22%**	22%
	Poor	28%	**41%**	42%
Willamette Valley Ecoregion	Good	25%	**36%**	39%
	Fair	20%	**28%**	30%
	Poor	25%	**36%**	39%
Cascades Ecoregion	Good	30%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	42%	**75%**	76%
	Fair	19%	**25%**	26%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	23%	**31%**	31%
	Fair	14%	**16%**	17%
	Poor	34%	**52%**	53%
Northern Rockies Ecoregion	Good	35%	**55%**	55%
	Fair	18%	**23%**	24%
	Poor	18%	**22%**	23%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	5%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	36%	**57%**	58%
	Fair	12%	**14%**	14%
	Poor	22%	**29%**	29%

Primary Contact Recreation Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	570.8	**1,886.8**	1,886.8
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Channels and Passages	Good	163.6	**541.6**	541.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Bays, Inlets, and Harbors	Good	203.5	**446.6**	453.17
	Fair	9.5	**14.4**	20.5
	Poor	9.5	**14.4**	20.5
Total of All Estuaries Statewide	Good	1,286.8	**2,875.0**	2,881.7
	Fair	9.7	**14.4**	20.7
	Poor	9.7	**14.7**	20.7

Primary Contact Recreation Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	30%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Channels and Passages	Good	30%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Bays, Inlets, and Harbors	Good	43%	**94%**	95%
	Fair	2%	**3%**	4%
	Poor	2%	**3%**	4%
Total of All Estuaries Statewide	Good	44%	**99%**	99%
	Fair	0%	**0.5%**	1%
	Poor	0%	**0.5%**	1%

Secondary Contact Recreation Use Support
Miles of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (miles)	Upper 90% Conf. Limit
Large Streams	Good	1,041.3	**2,105.2**	2,121.7
	Fair	100.3	**119.0**	133.8
	Poor	51.5	**62.8**	74.0
Small Streams	Good	26,589.7	**44,537.3**	44,694.3
	Fair	9,941.3	**11,825.7**	11,953.1
	Poor	9,094.8	**10,666.6**	10,788.4
Cascade Range Ecoregion	Good	2,436.5	**4,078.4**	4,127.9
	Fair	1,196.8	**1,530.5**	1,575.1
	Poor	653.2	**765.3**	799.6
Puget Lowlands Ecoregion	Good	2,746.2	**4,318.4**	4,375.8
	Fair	1,255.3	**1,546.4**	1,592.6
	Poor	1,609.7	**2,086.0**	2,137.1
Willamette Valley Ecoregion	Good	212.1	**340.5**	357.7
	Fair	111.6	**151.0**	165.8
	Poor	135.5	**189.5**	205.3
Cascades Ecoregion	Good	5,380.5	**17,770.9**	17,770.9
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
East Cascades and Foothills Ecoregion	Good	1,353.3	**2,443.1**	2,474.7
	Fair	618.6	**805.6**	838.0
	Poor	0	**0**	2.3
Columbia Basin Ecoregion	Good	7,831.1	**11,518.0**	11,620.1
	Fair	5,601.6	**7,320.4**	7,413.6
	Poor	5,101.8	**6,507.0**	6,597.0
Northern Rockies Ecoregion	Good	3,382.2	**6,123.7**	6,171.4
	Fair	521.8	**590.8**	621.9
	Poor	991.8	**1,181.6**	1,223.3
Blue Mountains Ecoregion	Good	14.6	**49.6**	49.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Total of All Streams Statewide	Good	27,708.6	**46,642.5**	46,801.1
	Fair	10,176.9	**11,944.7**	12,073.1
	Poor	9,182.9	**10,729.3**	10,852.4

Secondary Contact Recreation Use Support
Percent of Assessed Streams

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Streams	Good	46%	**92%**	93%
	Fair	4%	**5%**	6%
	Poor	2%	**3%**	3%
Small Streams	Good	40%	**66%**	67%
	Fair	15%	**18%**	18%
	Poor	14%	**16%**	16%
Cascade Range Ecoregion	Good	38%	**64%**	65%
	Fair	19%	**24%**	25%
	Poor	10%	**12%**	13%
Puget Lowlands Ecoregion	Good	35%	**54%**	55%
	Fair	16%	**19%**	20%
	Poor	20%	**26%**	27%
Willamette Valley Ecoregion	Good	31%	**50%**	53%
	Fair	16%	**22%**	24%
	Poor	20%	**28%**	30%
Cascades Ecoregion	Good	30%	**100%**	100%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
East Cascades and Foothills Ecoregion	Good	42%	**75%**	76%
	Fair	19%	**25%**	26%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	31%	**45%**	46%
	Fair	22%	**29%**	29%
	Poor	20%	**26%**	26%
Northern Rockies Ecoregion	Good	43%	**78%**	78%
	Fair	7%	**7%**	8%
	Poor	13%	**15%**	15%
Blue Mountains Ecoregion	Good	29%	**100%**	100%
	Fair	0%	**0%**	5%
	Poor	0%	**0%**	5%
Total of All Streams Statewide	Good	40%	**67%**	68%
	Fair	15%	**17%**	17%
	Poor	13%	**15%**	16%

Secondary Contact Recreation Use Support
Square Miles of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (sq. miles)	Upper 90% Conf. Limit
Deep Open Water Areas	Good	570.8	**1,886.8**	1,886.8
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Channels and Passages	Good	163.6	**541.6**	541.6
	Fair	0	**0**	2.3
	Poor	0	**0**	2.3
Bays, Inlets, and Harbors	Good	203.9	**440.7**	447.8
	Fair	16.5	**23.2**	30.5
	Poor	7.3	**11.6**	17.2
Total of All Estuaries Statewide	Good	1,297.9	**2,869.1**	2,876.4
	Fair	17.1	**23.2**	30.7
	Poor	7.5	**11.6**	17.3

Secondary Contact Recreation Use Support
Percent of Assessed Estuaries

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Deep Open Water Areas	Good	30	**100**	100
	Fair	0	**0**	0
	Poor	0	**0**	0
Channels and Passages	Good	30	**100**	100
	Fair	0	**0**	0
	Poor	0	**0**	0
Bays, Inlets, and Harbors	Good	43	**93**	94
	Fair	3	**5**	6
	Poor	2	**2**	4
Total of All Estuaries Statewide	Good	45	**99**	99
	Fair	1	**1**	1
	Poor	0	**0**	1

Aesthetic Enjoyment Use Support
Acres of Assessed Lakes

Strata	Rating	Lower 90% Conf. Limit	Assessed Size (acres)	Upper 90% Conf. Limit
Large Lakes	Good	77,132	**129,084**	129,350
	Fair	41,916	**53,862**	54,115
	Poor	9,823	**10,483**	10,612
Medium Lakes	Good	12,825	**20,546**	20,664
	Fair	8,653	**11,670**	11,784
	Poor	2,473	**2,731**	2,797
Small Lakes	Good	7,781	**12,852**	12,940
	Fair	4,241	**5,471**	5,553
	Poor	1,758	**1,984**	2,040
Cascade Range Ecoregion	Good	9,696	**16,429**	16,522
	Fair	4,446	**5,551**	5,636
	Poor	2,048	**2,301**	2,360
Puget Lowlands Ecoregion	Good	27,084	**44,605**	44,769
	Fair	17,561	**23,678**	23,840
	Poor	1,669	**1,764**	1,818
Willamette Valley Ecoregion	Good	131	**151**	168
	Fair	2,135	**4,199**	4,225
	Poor	264	**302**	325
Cascades Ecoregion	Good	31,597	**60,329**	60,431
	Fair	4,278	**4,657**	4,743
	Poor	2,395	**2,548**	2,613
East Cascades and Foothills Ecoregion	Good	1,355	**2,763**	2,779
	Fair	155	**181**	199
	Poor	0	**0**	2
Columbia Basin Ecoregion	Good	18,013	**25,393**	25,552
	Fair	20,305	**30,133**	30,295
	Poor	7,067	**8,074**	8,182
Northern Rockies Ecoregion	Good	6,967	**12,812**	12,874
	Fair	2,178	**2,601**	2,662
	Poor	189	**210**	229
Blue Mountains Ecoregion	Good	0	**0**	0
	Fair	0	**0**	0
	Poor	0	**0**	0
Total of All Lakes Statewide	Good	97,952	**162,482**	162,786
	Fair	54,988	**71,002**	71,292
	Poor	14,179	**15,199**	15,353

Aesthetic Enjoyment Use Support
Percent of Assessed Lakes

Strata	Rating	Lower 90% Conf. Limit	Percent of Assessed Size	Upper 90% Conf. Limit
Large Lakes	Good	40%	**67%**	67%
	Fair	22%	**28%**	28%
	Poor	5%	**5%**	5%
Medium Lakes	Good	37%	**59%**	59%
	Fair	25%	**33%**	34%
	Poor	7%	**8%**	8%
Small Lakes	Good	38%	**63%**	64%
	Fair	21%	**27%**	27%
	Poor	9%	**10%**	10%
Cascade Range Ecoregion	Good	40%	**68%**	68%
	Fair	18%	**23%**	23%
	Poor	8%	**9%**	10%
Puget Lowlands Ecoregion	Good	39%	**64%**	64%
	Fair	25%	**34%**	34%
	Poor	2%	**3%**	3%
Willamette Valley Ecoregion	Good	3%	**3%**	4%
	Fair	46%	**90%**	91%
	Poor	6%	**6%**	7%
Cascades Ecoregion	Good	47%	**89%**	89%
	Fair	6%	**7%**	7%
	Poor	4%	**4%**	4%
East Cascades and Foothills Ecoregion	Good	46%	**94%**	94%
	Fair	5%	**6%**	7%
	Poor	0%	**0%**	0%
Columbia Basin Ecoregion	Good	28%	**40%**	40%
	Fair	32%	**47%**	48%
	Poor	11%	**13%**	13%
Northern Rockies Ecoregion	Good	44%	**82%**	82%
	Fair	14%	**17%**	17%
	Poor	1%	**1%**	1%
Blue Mountains Ecoregion	Good	0%	**0%**	0%
	Fair	0%	**0%**	0%
	Poor	0%	**0%**	0%
Total of All Lakes Statewide	Good	39%	**65%**	65%
	Fair	22%	**29%**	29%
	Poor	6%	**6%**	6%

Causes of Use Impairment
Miles of Assessed Streams

Strata	Temperature	Dissolved Oxygen	pH	Ammonia	Fecal Coliform	Metals
Large Streams	961	127	275	21	629	991
Small Streams	16,949	3,542	16,247	891	27,438	18,832
Coast Range Ecoregion	792	28	28	0	2,805	0
Puget Lowlands Ecoregion	1,855	831	512	149	4,946	1,738
Willamette Valley Ecoregion	302	0	95	0	454	0
Cascades Ecoregion	1,281	1,248	1,249	0	0	145
East Cascades and Foothills Ecoregion	9	0	0	0	806	26
Columbia Basin Ecoregion	11,200	1,525	11,613	763	15,426	12,578
Northern Rockies Ecoregion	2,471	36	3,026	0	3,631	5,336
Blue Mountains Ecoregion	0	0	0	0	0	0
Total of All Streams Statewide	17,910	3,669	16,522	912	28,067	19,823

Causes of Use Impairment
Square Miles of Assessed Estuaries

Strata	Temperature	Dissolved Oxygen	pH	Ammonia	Fecal Coliform
Deep Open Water Areas	1,572.3	1,886.8	157.2	0	23.1
Channels and Passages	325.0	346.7	21.7	0	87.9
Bays, Inlets, and Harbors	302.6	151.3	108.1	0	307.6
Total of All Estuaries Statewide	2,199.9	2,384.8	287.0	0	418.6

Causes of Use Impairment
Percent of Assessed Streams

Strata	Temperature	Dissolved Oxygen	pH	Ammonia	Fecal Coliform	Metals
Large Streams	39%	6%	10%	1%	29%	59%
Small Streams	26%	7%	19%	1%	53%	28%
Coast Range Ecoregion	28%	6%	6%	0%	39%	0%
Puget Lowlands Ecoregion	22%	12%	5%	3%	60%	35%
Willamette Valley Ecoregion	56%	0%	11%	0%	67%	0%
Cascades Ecoregion	9%	4%	4%	0%	0%	20%
East Cascades and Foothills Ecoregion	14%	0%	0%	0%	14%	100%
Columbia Basin Ecoregion	49%	3%	34%	2%	42%	43%
Northern Rockies Ecoregion	37%	5%	37%	0%	44%	80%
Blue Mountains Ecoregion	0%	0%	0%	0%	0%	0%
Total of All Streams Statewide	31%	7%	16%	1%	44%	43%

Causes of Use Impairment
Percent of Assessed Estuaries

Strata	Temperature	Dissolved Oxygen	pH	Ammonia	Fecal Coliform
Deep Open Water Areas	83%	100%	8%	0%	1%
Channels and Passages	60%	64%	4%	0%	10%
Bays, Inlets, and Harbors	64%	32%	23%	0%	41%
Total of All Estuaries Statewide	65%	52%	15%	0%	14%

Causes of Use Impairment
of Assessed Lakes

Strata	Nutrients	
	Size Impaired (acres)	Percent of Assessed
Large Lakes	64,345	33%
Medium Lakes	14,401	41%
Small Lakes	7,455	37%
Coast Range Ecoregion	7,852	32%
Puget Lowlands Ecoregion	25,442	37%
Willamette Valley Ecoregion	4,501	96%
Cascades Ecoregion	7,205	11%
East Cascades and Foothills Ecoregion	181	6%
Columbia Basin Ecoregion	38,207	60%
Northern Rockies Ecoregion	2,811	18%
Blue Mountains Ecoregion	Not Assessed	Not Assessed
Total of All Lakes Statewide	86,201	35%

Possible Pollution Sources of Use Impairment
Size of Assessed Waters

Source Categories	Streams (miles)	Lakes (acres)	Estuaries (sq. miles)
Industrial Point Sources	1,964	0	313.8
Municipal Point Sources	4,771	291	702.9
Combined Sewer Overflows	842	0	122.7
Stormwater Runoff	4,210	6,981	205.8
Septic Tanks	7,016	6,399	115.8
Agriculture	23,012	11,344	492.6
Silviculture	2,526	291	0
Construction	2,526	1,745	0
Resource Extraction	4,210	0	0
Land Disposal	561	291	92.7
Hydromodification	12,909	586	0
Natural Sources	7,858	8,726	1,473.6
Other Sources	1,684	2,618	89.8
Unknown Sources	3,648	70,682	572.6
No Sources are Impairing Uses	24,026	157,567	658.2

Possible Pollution Sources of Use Impairment
Percent of Assessed Waters

Source Categories	Streams	Lakes	Estuaries
Industrial Point Sources	3%	0%	8%
Municipal Point Sources	7%	0%	24%
Combined Sewer Overflows	1%	0%	4%
Stormwater Runoff	6%	3%	7%
Septic Tanks	10%	3%	4%
Agriculture	33%	5%	17%
Silviculture	4%	0%	0%
Construction	4%	1%	0%
Resource Extraction	6%	0%	0%
Land Disposal	1%	0%	3%
Hydromodification	18%	0%	0%
Natural Sources	11%	4%	51%
Other Sources	2%	1%	3%
Unknown Sources	5%	28%	20%
No Sources are Impairing Uses	35%	63%	27%

Note that the sum of all percentages exceed 100%, since individual waters can be impaired by multiple pollution sources.

Comparison of the Judgemental Design Method and Probability-based Design Method:

The assessments of water quality data for the aquatic life use from the REMAP project and AMP were analysed using the contingency table below. The probability value of 0.31 suggests that the two sample survey designs do not result in the same population of assessment data. The value represents that we are only 69% sure that the two designs result in the same assessment. It is typically accepted that statistical tests require a 95% assurance before it can be stated that the designs are the same. The analysis shows that the REMAP data collected by probability-based design identifies more use impairments than the AMP data collected by a judgemental design.

Contingency Table for Comparing Sample Survey Designs

Ho: The two sample survey designs result in the same assessment
Ha: The two sample survey designs result in assessments that are not the same.

Z = 0.500 p = 0.31 Reject Ho

Data Source	Stations Fully Supporting Aquatic life Use	Stations with Aquatic Life Use Impaired	Total Stations Assessed	Proportion Assessed as Good	Proportion assessed as Fair of Poor
AMP	3	5	8	0.375	0.625
REMAP	2	6	8	0.250	0.750
Total	5	11	16	0.3125	0.6875

Conclusions:

- The use of a sample survey approach, instead of a census approach, for assessments better addresses the types of questions that Section 305(b) is intended to answer.

- The use of the sample survey approach greatly increased the amount waters assessed for this report: 98% of streams, 100% of estuaries, and 99% of lakes statewide were asssessed with this approach.

- The REMAP data collected by probability-based design identifies more use impairments than the AMP data collected by a judgemental design.

- Of the designated uses assessed, no impairment was found in 41% of all streams, 35% of estuaries, and 65% of lakes statewide.

- All assessed aquatic life uses were fully supported in 63% of all streams and 33% of estuaries statewide.

- Swimming was assessed as fully supported in 57% of all stream and 99% of estuaries statewide.

- Aesthetic enjoyment due to trophic state was fully supported in 65% of lakes statewide.

- The primary cause of use impairment in streams is fecal coliform.

- The primary cause of use impairment in estuaries is temperature created by natural conditions.

- The primary cause of human-caused use impairment in estuaries is fecal coliform.

- The primary cause of use impairment in lakes is excessive nutrients.

- The primary human-caused source of pollution that is impairing all surface waters (streams, estuaries, and lakes) is agriculture.